

Process Modeling and Simulation of the Service Configuration and Activation Process: An eTOM-Based Case Study

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Abstract. *The increasing complexity of operations in the telecom sector is a consequence of fast-paced technology advancements, diversification of services and growing customer expectations for quality and speed of service. In this respect, the competitiveness and performance of the organization now depend on increasing operational efficiency. In this context, service configuration and activation are decisive procedures that guarantee the shift from client requests to the efficient provision of telecommunications services. The purpose of this paper is to use the enhanced Telecom Operations Map as a reference framework for organizing operational processes in order to analyze the service configuration and activation process. In order to improve overall operational efficiency and reduce execution times, the process is analyzed in its current state and redesigned into an optimized version.*

Business process modeling and simulation form the basis of the research methodology. Bizagi, a specialized process modeling and simulation tool, was used to model the examined process using Business Process Model and Notation. The two scenarios AS-IS and TO-BE have been simulated to compare the performance of the processes. The comparison shows the effect of the proposed changes on the service activation time and resource utilization. The findings show that operational inefficiencies can be found and evidence-based optimization decisions are supported by process modeling and simulation. The main contribution of this paper is the proposition of an effective and practical operational model for service configuration and activation, which can be used by telecom operators to improve customer satisfaction and operational performance. The model was tested by simulation.

Keywords: telecommunications, service configuration and activation, business process modeling, eTOM framework, process, Bizagi.

Introduction

The two scenarios AS-IS and TO-BE have been simulated to compare the performance of the processes. The comparison shows the effect of the proposed changes on the service activation time and resource utilization. The main contribution of this paper is the proposition of an effective and practical operational model for service configuration and activation, which can be used by telecom operators to improve customer satisfaction and operational performance. The model was tested by simulation. This increasing complexity of telecommunications operations is mainly due to the rapid technological evolution and the continuous growth of service portfolios. Thus, the good management of processes is of critical importance to maintain competitiveness in an increasingly

dynamic market, to reduce operational costs and to ensure the quality of service. In the telecommunications environment technical infrastructures, software platforms and organizational structures are interrelated in a very complex manner. In absence of structured approaches to process analysis and optimization, these interactions may lead to operational inefficiencies, longer service delivery times and lower customer satisfaction. Recent technology developments also underscore the need for standardized and efficient operational models. In this context, the enhanced Telecom Operations Map (eTOM) offers a well-established reference framework for the structuring and evaluation of telecommunication processes.

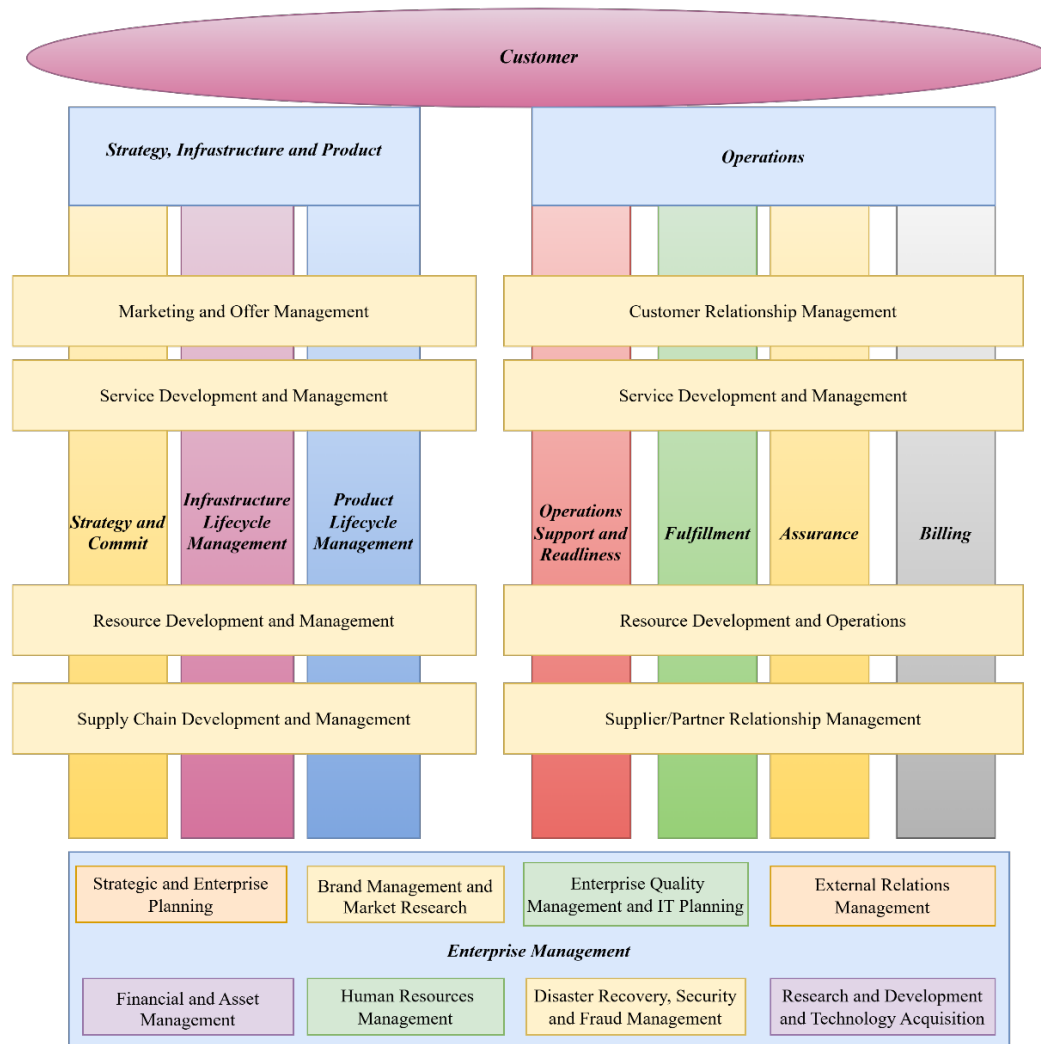


Figure 1. eTOM Process Model

Source: Adapted from TM Forum (2019).

The Business Process Framework groups telecommunications processes into three major domains: strategy and infrastructure, operations, and enterprise management. Strategic processes define the technological and commercial direction of the company through planning, infrastructure development, and service portfolio management (Pardamean Wirman, 2015).

Operational processes directly affect service quality and continuity through performance monitoring, incident management, billing and network operations. Enterprise management processes provide governance, financial management, human resources and performance evaluation, all of which contribute to the overall operation of the organization. The domains together form a structured framework for analysis and optimization of telecommunications operations. Within each macro-process, both vertical and horizontal process groupings are identified based on their role and magnitude of impact within the organization. eTOM is also recognised as an international standard under ITU-T Recommendation M.3050 and can be used as a reference model in the analysis of network operation and management processes (Chang, 2011).

The framework provides operational processes specific to service providers and highlights how they can be mapped within eTOM at the horizontal functional level (e.g., Customer Relationship Management, Service Management and Operations, and Resource Management and Operations) and the vertical end-to-end level (e.g., Operational Support and Readiness, Fulfillment, Assurance and Billing (Czarnecki, 2013)). This paper focuses on the processes in the Operations domain, due to the critical role that these processes have in the delivery, monitoring and support of telecom services. These processes directly affect operational performance and user experience, thus being the main object of analysis in this study. The analysis aims to give an overview of the structure, coordination and execution of important processes.

Service configuration and delivery to customers are part of the Fulfillment domain. These activities include order processing, service configuration in OSS/BSS systems, equipment installation and service activation (Smidovych, 2022). The main goal is to reduce activation time and ensure an efficient transition from placing an order to using a service, which directly affects customer satisfaction. Fulfillment is one of the major sub-domains within the Operations process group.

The Fulfillment domain is concerned with turning customer requests into services that are delivered correctly and within the timeframes that have been agreed. This domain in eTOM consists of a set of Level 2 processes with standardized functions that can be used as a reference for designing a “to-be” model for cost reduction and market adaptation. Construction of such a model requires analysis of OSS systems, mapping of activities to eTOM processes, and derivation of structured operational recommendations (Chang, 2011). Modern BSS/OSS systems must deliver full process automation, scalability and quick adaptation to technological and traffic developments with the cost reduction and vendor independence.

Telecommunications operators can offer efficient services and remain competitive thanks to these requirements. (Smidovych, 2022)

The main sub-processes of service fulfillment processes are: Customer Interface Management, Order Handling, Service Configuration & Activation, Resource Provisioning, Service Testing, Problem Handling during Fulfillment.

Service Configuration & Activation processes include the operations of selecting, implementing, configuring, activating, and testing specific services. These operations are performed to meet customer demands or to satisfy requests from other processes to remedy capacity shortfalls, availability problems or conditions of service failure. These processes are also applicable to Customer Premises Equipment (CPE) when it is part of the service provider’s offering (TM Forum, 2019).

The Service Configuration and Activation process involves several key operational roles, including performing feasibility checks before placing the order for service designs requested by customers, allocating specific service parameters required to support service orders, reserving parameters until the order confirmation, implementing and activating services, testing the

configured services, and reporting the progress of service orders to related operational procedures (TM Forum, 2019).

Although business process modeling techniques and telecommunications process frameworks have been extensively researched, comparatively few studies integrate standardized frameworks like eTOM with BPMN-based modeling and simulation to assess improvements in operational performance in particular service fulfillment processes. Specifically, from the standpoint of simulation-based operational analysis, the Service Configuration and Activation process has gotten little attention.

Therefore, the purpose of this study is to use the eTOM reference framework in conjunction with BPMN process modeling and simulation to analyze and optimize the Service Configuration and Activation process. By creating and assessing an optimized TO-BE operational model through comparative simulation of AS-IS and TO-BE scenarios, the study makes a contribution by emphasizing gains in operational efficiency and service activation time.

Literature review

The increasing complexity of telecommunications operations due to fast technological development and service diversification has been extensively discussed in the scientific literature (Alwanto & Yel, 2025). Telecommunications companies have a complex interweaving of technical infrastructures, software platforms and organizational structures which means that structured approaches to process management are needed in order to attain efficiency and quality of service. (Geseleva, 2021) Such strategies can avoid operational bottlenecks, increased costs and a drop in service quality. Some studies indicate the need for standardized frameworks to structure and evaluate the processes of telecommunications.

The improved Telecom Operations Map is aligned with the ITU-T recommendations and is regarded as an international reference framework for business processes in the telecom industry (Chang, 2011).

This approach allows to cluster processes into well defined domains and end-to-end flows for the categorization, analysis and optimization of operational activities. Its modular design facilitates the reuse of processes and continuous improvement (Duque, 2017). Within the operational domain, service fulfillment procedures are crucial in converting client requests into services provided.

Service configuration and activation is one of the most complex fulfillment processes due to the need to coordinate feasibility checks, resource allocation, service implementation and validation activities (TM Forum, 2019). Inefficiencies in this process may lead to lower customer satisfaction, longer service delivery times and higher operating costs (Keber, 2004).

The work of the organization is based on the interdependence of processes, their efficiency and direct operational activities. The specialized literature identifies three main types of processes: primary processes, aimed at value creation; support processes, which provide the necessary resources; and management processes, in charge of coordination and control. In complex industries such as telecommunications, the interaction of these processes is required for the efficient functioning of the organization and the quality of the services offered (Delgado, 2021). Business process modelling is a well-known technique for the evaluation and improvement of telecom operations. The use of standardized modeling techniques encourages transparency and cross-functional understanding of the processes being modeled, and enables the clear depiction of process flows, decision points and responsibilities (Chang, 2011).

Additionally, prior to implementation, process simulation is being used more and more to assess potential performance improvements and alternative process scenarios (Duque, 2017).

Existing research shows the need for applied approach that integrates process modeling and simulation for particular fulfillment processes, despite the widespread use of reference frameworks and modeling techniques. In order to close this gap, the current study analyzes the service configuration and activation process from an end-to-end operational perspective by building on existing frameworks and methodologies. However, limited studies combine BPMN-based modeling and simulation to evaluate service configuration and activation processes from an operational performance perspective.

Research Hypotheses

Based on the findings presented in the existing literature on process standardization, business process modeling and operational efficiency in telecommunications environments the following research hypotheses are proposed:

H1. The use of the eTOM framework in modeling the service configuration and activation process enables a systematic identification of operational flows and sources of inefficiency.

H2: The service activation time is reduced by changing the service configuration and activation process.

H3: Process simulation enables an objective assessment of the effect of optimization on the overall operational efficiency.

Methodology

This study aims to analyze and enhance the Service Configuration and Activation process in telecommunications using a qualitative and applied research approach. The process under investigation was chosen because it plays an important part in service delivery and has a direct impact on activation time and operational efficiency. It is included in the Fulfillment domain of the enhanced Telecom Operations Map.

The research methodology employs business process modeling, utilizing Business Process Model and Notation as a standardized representation technique. The Bizagi platform was used to create and study process models and to perform process simulation in a controlled environment, allowing the evaluation of operational performance under different scenarios (Chang, 2011).

The research began with the analysis of the process in its current state (AS-IS), based on operational documentation and observed activity flows. The AS-IS model enabled the identification of manual interventions, waiting times, and operational constraints affecting process performance. Based on the results of this analysis, an improved future state (TO-BE) was defined, with the goal of making operational flows more efficient and cutting down on execution time. To make sure the results were comparable, the TO-BE scenario was modeled and simulated using the same input parameters as the AS-IS scenario. The research hypotheses were tested through a comparative analysis of the simulation results obtained for the AS-IS and TO-BE scenarios, using performance indicators such as process duration and operational efficiency. Simulation was employed as a validation tool to assess the impact of the proposed process improvements and to support the conclusions of the study (Axenath, 2005).

In order to provide a clearer understanding of the operational workflow, the Service Configuration and Activation process was modeled using BPMN, describing the sequence of activities and interactions between operational roles involved in the service fulfillment process.

Following the “Implement, Configure and Activate Service” activity, resource orders are initiated and network and IT resources are allocated within the Resource Management domain. Following resource provisioning, the service is put through end-to-end testing, the results of which decide whether to activate rollback and escalation mechanisms or continue the process. The procedure is finished with service status reporting, service order closure, and final service activation in the event that the test is successful.

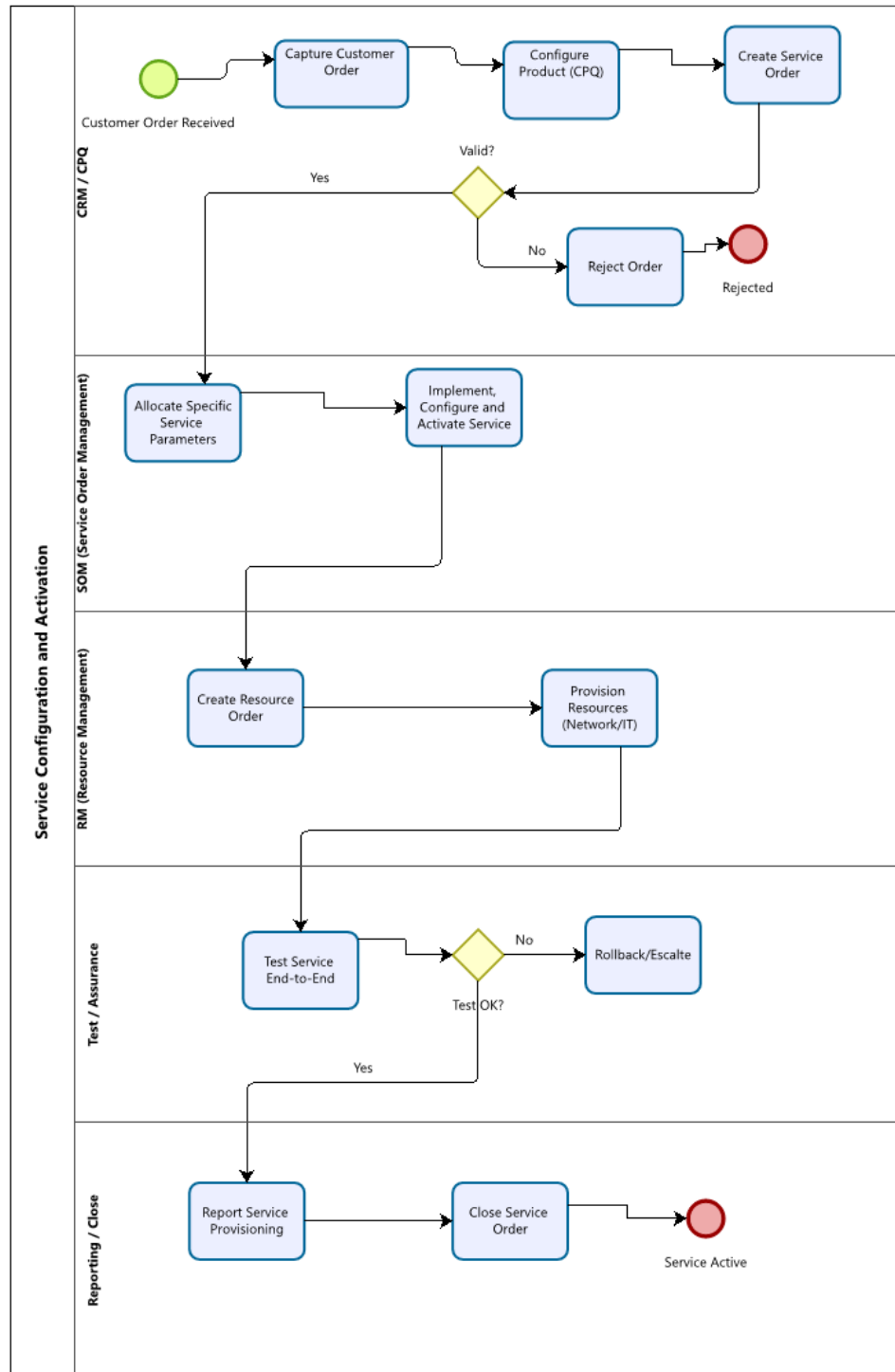
Both AS-IS and TO-BE scenarios can be simulated using the BPMN model, which offers a unified representation of the process. The main distinctions between these scenarios are related to execution parameters and the level of automation. This method facilitates the assessment of optimization effects on service delivery time and operational efficiency as well as a comparative analysis of process performance. Depending on the characteristics of each process stage, deterministic values and statistical distributions were used to parameterize activity execution times. To represent actual behavior seen in telecommunications operational environments, activities with high operational variability were modeled using triangular distributions defined by minimum, most likely, and maximum values. In the TO-BE scenario, automated or orchestrated tasks were modeled with shorter or no execution times, indicating the removal of manual interventions. To illustrate the effect of automation and resource sizing on the total end-to-end process duration, resources were allocated to activities according to the operational roles involved, and their capacity was changed between the AS-IS and TO-BE scenarios.

The AS-IS scenario was created to simulate how a telecom company's Service Configuration and Activation process currently operates. Its main goal is to highlight structural inefficiencies and operational constraints that exist prior to the implementation of optimization measures. In order to ensure direct comparability of results, the process structure in this scenario was kept the same as in the TO-BE scenario. Differences between the scenarios were limited to execution times and resource utilization. The AS-IS scenario was simulated over a 24-hour time horizon, which was long enough to capture realistic process behavior under current operating conditions and enable the full execution of initiated process instances. Ten process instances corresponding to incoming service orders were initiated during the simulation. Of these, eight instances successfully finished the process flow and attained the final state of Service Active, while two instances were rejected during the validation stage.

Results and discussions

The Service Configuration and Activation process is part of the Fulfillment domain of the enhanced Telecom Operations Map. It translates customer service requests into operational services. The efficiency of this process has a direct impact on the time of service delivery and customer satisfaction. The process starts with the receipt of a service order and ends with the successful activation of the service and notification of the customer (Talja, 2013).

From an operational point of view, the process under study is composed by a sequence of steps including service feasibility check, configuration of service-specific parameters, resource allocation, service activation and service verification. The process execution includes interaction between several operational roles and systems and decision points that can influence the speed and efficiency of service activation. The process was modeled using Business Process Model and Notation to allow an organized and cohesive analysis of the operational flow. We chose BPMN because it offers a standard way of representing events, activities and decision gateways so that the end-to-end process flow is clearly visible (Axenath, 2005).



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Figure. 2 BPMN Model of the Telecommunications Service Configuration and Activation process

Source: Authors' own research.

The BPMN diagram illustrates Service Configuration and Activation process in a telecom company. The diagram shows the process from capturing, validating, implementing and delivering a service order to the end user. The use of functional swim lanes allows a clear representation of the roles and the interactions between commercial, operational and technical activities, aligned with the main organizational domains involved.

The customer order is received to start the workflow. Next, the order is captured and configured within the CRM/CPQ domain using the activities Capture Customer Order and Configure Product (CPQ). Using the Create Service Order activity, the order is formalized and it undergoes a validation phase. Validated orders are sent to the Operational stages, and non-compliant orders are rejected. The Service Order Management domain assigns service specific parameters to make sure transition from commercial layer to technical execution.

The simulation model incorporates explicit resource allocation settings defined within the Bizagi environment. The availability of operational roles was configured in the Resources module, specifying the number of instances for each role involved in the Service Configuration and Activation process.

Table 1. Resource Allocation and Capacity Settings for the AS-IS Simulation Scenario

The screenshot shows a window titled 'Resources' with two tabs: 'Availability' and 'Costs'. The 'Availability' tab is active. It contains a table with two columns: 'Resources' and 'Quantities'. The table lists five roles with their respective quantities: Sales Agent (4), Service Designer (3), Network Engineer (5), QA Engineer (2), and Ops Analyst (2). Each quantity is in a text input field with a dropdown arrow. At the bottom of the window, there is a 'Resources' icon and an 'Ok' button.

Resources	Quantities
Sales Agent	4
Service Designer	3
Network Engineer	5
QA Engineer	2
Ops Analyst	2

Source: Authors' own research.

These amounts of resources were used to simulate real-world operational constraints and workload distribution. In discrete-event simulation, the availability of resources is directly linked to the formation of queues, the waiting times incurred and the total length of the process.

The TO-BE scenario featured scaled resource capacities or replacement with automated tasks, showing the effects of orchestration and process redesign on workload allocation and execution times.

In the AS-IS scenario the process is characterized by long run times and a higher degree of manual intervention in key operational steps. Average time for Capture Customer Order activity is around 18 minutes, Configure Product (CPQ) and Allocate Specific Service Parameters average 45 and 52 minutes respectively.

The average duration of the Create Resource Order activity is approximately 40 minutes. This indicates delays in coordination and sequential execution of tasks. The longest phase of the process is Implement, Configure and Activate Service taking on average around 60 minutes. Additionally, the average Test Service End-to-End duration is around 20 minutes, and the final operational stages, Report Service Provisioning and Close Service Order, average 25 and 18 minutes, respectively.

Table 2.Simulation results of the Service Configuration and Activation process – AS-IS scenario

Name	Type	Instances completed	Instances started	Min. time (m)	Max. time (m)	Avg. time (m)	Total time (m)
Service Configuration and Activation	Process	10	10	41.3709560677906	308.877515120303	244.333807404309	2443.33807404309
Customer Order Received	Start event	10					
Capture Customer Order	Task	10	10	6.87382711544188	12.8820180691468	9.95899731877727	99.5899731877727
Configure Product (CPQ)	Task	10	10	18.9654924970305	33.4694136573039	26.2011772725953	262.011772725953
Create Service Order	Task	10	10	0	0	0	0
Allocate Specific Service Parameters	Task	8	8	0	0	0	0
Implement, Configure and Activate Service	Task	8	8	62.9369441321173	68.123969465445	65.8149857705626	526.519886164501
Create Resource Order	Task	8	8	69.3274038337565	75.7720320347865	72.3676316573916	578.941053259133
Provision Resources (Network/IT)	Task	8	8	0	0	0	0
Test Service End-to-End	Task	8	8	22.6615529745096	38.3296855076777	31.719125480179	253.753003841432
Report Service Provisioning	Task	8	8	67.2437129504161	72.5824011107759	70.6532745752711	565.226196602169
Close Service Order	Task	8	8	12.9308964534347	27.7883316950543	18.4120235327657	147.296188262125
Valid?	Gateway	10	10				
Rejected	End event	2					
Reject Order	Task	2	2	5	5	5	10
Test OK?	Gateway	8	8				
Rollback/Escalate	Task	0	0	0	0	0	0
Service Active	End event	8					

Source: Authors' own research.

The temporal performance analysis shows that the extended execution time for key activities in the AS-IS scenario has a significant impact on the process efficiency, although the functional outcome is finally achieved. The average time to complete the process is around 244 minutes, and the maximum time can reach 300 minutes. Such values are indicative of the sequential nature of operational tasks and the heavy reliance on manual interventions.

The main contributors to the overall processing time are activities like Allocate Specific Service Parameters, Create Resource Order, Implement, Configure and Activate Service, due to their long execution time and coordination purposes.

In summary, the AS-IS scenario shows a process that is functionally effective but operationally inefficient, with long execution times and limited predictability in the time of service delivery. These findings support the need of process redesign and provide a baseline for the assessment of the improvements implemented in the TO-BE scenario.

The use of orchestration mechanisms and automated configuration systems was reflected in the modeling of the tasks Create Service Order, Implement, Configure and Activate Service, and Provision Resources (Network/IT) as completely automated tasks with minimal execution time.

The main process activities in the TO-BE scenario exhibit significantly reduced average execution times, as follows: Capture Customer Order – average duration of approximately 10 minutes, Configure Product (CPQ) – average duration of approximately 26 minutes, Allocate Specific Service Parameters – average duration of approximately 31 minutes, Create Resource Order – average duration of approximately 26 minutes, Test Service End-to-End – average duration of approximately 18 minutes, Report Service Provisioning – average duration of approximately 21 minutes and Close Service Order – average duration of approximately 18 minutes.

Table 3. Simulation Results of the Service Configuration and Activation process – TO-BE Scenario

Name	Type	Instances completed	Instances started	Min. time (m)	Max. time (m)	Avg. time (m)	Total time (m)
Service Configuration and Activation	Process	10	10	41.3709560677906	170.665533464079	129.274176050879	1292.74176050879
Customer Order Received	Start event	10					
Capture Customer Order(UT)	Task	10	10	6.87382711544188	12.8820180691468	9.95899731877727	99.5899731877727
Configure Product (CPQ)(ST)	Task	10	10	18.9654924970305	33.4694136573039	26.2011772725953	262.011772725953
Create Service Order(ST)	Task	10	10	0	0	0	0
Allocate Specific Service Parameters	Task	8	8	24.5390038670486	39.4314510558296	31.4257368859516	251.405895087613
Implement, Configure and Activate Service	Task	8	8	0	0	0	0
Create Resource Order (RO)	Task	8	8	22.4952833049347	29.6575784914492	26.4470505825513	211.576404660411
Provision Resources (Network/IT)	Task	8	8	0	0	0	0
Test Service End-to-End	Task	8	8	12.0616300690649	22.016944672773	18.2044162478438	145.635329982751
Report Service Provisioning	Task	8	8	17.2437129504161	22.5824011107759	20.6532745752711	165.226196602169
Close Service Order	Task	8	8	12.9308964534348	27.7883316950543	18.4120235327657	147.296188262125
Valid?	Gateway	10	10				
Rejected	End event	2					
Reject Order	Task	2	2	5	5	5	10
Test OK?	Gateway	8	8				
Rollback/Escalate	Task	0	0	0	0	0	0
Service Active	End event	8					

Source: Authors' own research.

In the TO-BE scenario, gateways for testing and validation are still active to keep the process realistic. Simulation results showed that two service orders were rejected during validation and that none of the orders tested required rollback or escalation. These results indicate that the proposed optimizations enhance the process stability, rather than decrease the process quality. The execution times of activities were parameterized on the basis of practical operational experience in telecommunications environments.

The values assigned represent realistic task durations for service delivery operations, taking into account typical coordination delays, system interactions, and the need for manual intervention. This practical basis improves the credibility of the simulation model and supports the relevance of the obtained results in real-world operational contexts.

The simulation was run with a fixed random seed to ensure that results are reproducible across all scenarios. The AS-IS and TO-BE configuration were simulated with the same arrival patterns and time horizons, thus a direct comparison between the performance indicators was possible. The number of replications was made to reduce stochastic variability and ensure stability of the reported average values. The improvements shown in the TO-BE scenario are in accordance with the practices adopted in the telecommunication industry nowadays, where automation is facilitated by service orchestration platforms in OSS/BSS environments, workflow orchestration engines, API-based integration of systems and zero-touch provisioning techniques. (Chang, 2011; Smidovych, 2022). Robotic process automation, rule-based automation engines, event-oriented architectures, and microservices-based integrations are increasingly adopted by modern telecom operators to reduce manual intervention and improve consistency of execution.

Therefore, rather than centered on theoretical assumptions, the modeled execution time reductions are consistent with practical technological implementations.

The structural impact of the suggested optimizations on the Service Configuration and Activation process's performance is amply demonstrated by the time-based simulation used to compare the AS-IS and TO-BE scenarios. However, the AS-IS scenario is characterized by substantially longer execution times and high variability in the end-to-end duration, and ultimately both scenarios result in the same functional outcome over a long time horizon, namely the activation of all valid service orders. The limited capacity of operational resources and the largely manual execution of the core operational tasks are the main causes of these limitations.

On the other hand, the TO-BE scenario shows that the average service delivery time can be decreased by almost 50% by automating configuration and provisioning tasks and boosting parallel

execution capacity. This improvement makes same-day service delivery operationally feasible and significantly improves process predictability. The results confirm that the improvements in the efficiency of the telecommunications process are due to the intelligent redesign of operational flows and the optimization of the resources used, and not to the elimination of quality control mechanisms. The proposed optimizations therefore directly support the goals of digital transformation in telecommunication companies and improve operational performance. The average end-to-end duration in the AS-IS configuration is about 244 minutes. This is due to the sequential execution of tasks, manual interventions, and resource constraints in the key activities. In the TO-BE configuration, the automation of configuration and provisioning tasks combined with a higher parallel execution capacity results in an average end-to-end duration of around 129 minutes.

That is an absolute drop of more than 100 minutes, and an overall improvement of about 47%. The observed performance gains are consistent across the core operational activities and are achieved without changing the functional outcome of the process as the number of initiated, rejected and completed service orders remains same. The results indicate efficiency gains through structural re-design of processes and optimal resource utilization.

Hypothesis Validation

The results of the simulation support the research hypotheses developed in this study. H1 is supported as the combination of the eTOM framework and BPMN modeling provided a structured representation of the operational workflow and helped identify inefficiencies in the Service Configuration and Activation process. The results of the comparative simulation confirm H2, which demonstrates that the redesigned TO-BE scenario significantly reduces the total service activation time compared to the AS-IS configuration. H3 is also supported, as the simulation environment furnished an objective assessment of the proposed optimisation measures and quantitative evidence of enhancements in operational efficiency.

Conclusion

The process-oriented approach based on the eTOM framework, modeling with BPMN and simulation was applied to analyze the Service Configuration and Activation process in a telecom company. The increasing operational complexity of telecommunications services makes the achievement of faster service delivery and improved operational performance an essential prerequisite. This can be achieved by increasing the effectiveness of the service provisioning procedures. The study showed that process modeling provides an organized and transparent view of the whole service provisioning flow, allowing a systematic identification of performance limitations and operational inefficiencies. The AS-IS analysis showed a process that is functionally efficient, but exhibits high execution times, high variability in end-to-end durations and heavy reliance on sequential execution and manual tasks. These characteristics are detrimental to operational efficiency and service delivery predictability.

The TO-BE scenario resulted in a large performance improvement through redesign of the process, automation and parallel execution in critical tasks. The simulation results showed a significant reduction in the average end-to-end service delivery time, improved resource utilization and process predictability, while maintaining the existing validation and quality control procedures. The comparative analysis indicated that the principal drivers of performance improvements were

the intelligent redesign of the operational flow and the optimization of resources, but not the elimination of control stages.

The outcomes are consistent with the research hypotheses and demonstrate that the integration of standardized frameworks, process modeling and simulation is an effective way to evaluate and improve key telecommunications processes. The proposed TO-BE model provides a practical and reusable reference for telecom operators to improve service provisioning efficiency and support digital transformation initiatives.

The main limitation of this study is that it only considers one operational process. Future research can extend the approach to other fulfillment and assurance processes and explore the use of advanced automation and orchestration mechanisms for further improvements in operational performance.

The simulation model was calibrated by documented procedures and professional operational knowledge, without direct empirical time-and-motion measures or event-log data. Hence, the results should be viewed as model-based performance estimates, not empirically verified operational results. The main contribution of the paper is the structured integration of eTOM based process modeling and simulation to quantitatively evaluate the performance improvements of the service activation workflows.

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